

WHAT IS CLAIMED IS:

1. A semiconductor testing apparatus for supplying a test input signal to a semiconductor device as a testing target and receiving an output signal from the semiconductor device, comprising:

a test program memory section configured to store a test program including at least a wait time for testing the semiconductor device;

a measuring/deciding section, connected to the test program memory section, for receiving the test program stored in the test program memory section and supplying the test signal to the semiconductor device in accordance with the test program having the wait time set to a predetermined value, and detecting an optimal value of the wait time through a series of processes comprising measuring, after elapse of the wait time, the electrical characteristics of the semiconductor device on the basis of the response signal outputted from the semiconductor device, and making an OK/NG decision on the electrical characteristics of the semiconductor device on the basis of the measurement results, and, if the decision is "NG", remeasuring the electrical characteristics of the semiconductor device under a newly set wait time and, for each newly set wait time, performing the remeasuring operation on the electrical characteristics of the semiconductor device until the result of such

a decision is "OK", and initiating the next measuring operation when the result of that decision is "OK"; and

a wait time initializing/changing control section, connected to the measuring/deciding section, for receiving the result of the OK/NG decision from the measuring/deciding section after an initialization of the wait time included in the test program and controlling the measuring/deciding section to, if the result of the OK/NG decision is "NG", repeat the setting of the wait time in a manner to sequentially increment the wait time toward an initially determined maximal value until the result of the decision is "OK" and, if the result of the decision is "OK", terminate the setting of the wait time.

2. The apparatus according to claim 1, further comprising a first memory section, connected to the measuring/deciding section, for storing the result of the OK/NG decision of the measuring/deciding section as a flag; and a second memory section, connected to the wait time initializing/changing control section, for storing the wait time set by the wait time initializing/changing control section.

3. A semiconductor testing apparatus for supplying a test input signal to a semiconductor device as a testing target and receiving an output signal from the semiconductor device, comprising:

a test program storing section configured to store

a test program including at least a wait time for testing the semiconductor device;

5 a measuring/deciding section, connected to the test program storing section, for receiving the test program stored in the test program storing section and supplying the test signal to the semiconductor device in accordance with the test program having the wait time set to a predetermined value, and detecting an optimal value of the wait time through a series of  
10 processes comprising measuring, after elapse of the wait time, the electrical characteristics of the semiconductor device on the basis of the response signal outputted from the semiconductor device, and making an OK/NG decision on the electrical  
15 characteristics of the semiconductor device on the basis of the measurement results, and, if the decision is "NG", remeasuring the electrical characteristics of the semiconductor device under a newly set wait time and, for each newly set wait time, performing the  
20 remeasuring operation on the electrical characteristics of the semiconductor device until the result of such a decision is "OK", and initiating the next measurement operation when the result of that decision is "OK";

25 a wait time adjusting flag memory section, connected to the measuring/deciding section, for setting a flag to an ON state when the result of the decision by the measuring/deciding section is "NG"; and

a wait time initializing/changing control section,  
connected to the measuring/deciding section and wait  
time adjusting flag memory section, for initializing  
the wait time included in the test program to an  
5 initially determined maximal value and, thereafter,  
gradually decrementing the wait time to a predetermined  
value, unless the result of the decision by the  
measuring/deciding section is "OK" and the wait time  
adjusting flag is set to an ON state, and, if the  
10 result of the decision is found to be "NG", to  
gradually increment the wait time toward an initially  
determined maximal value, until the result of the  
decision is "OK" after the wait time adjusting flag has  
been set to the ON state, and terminating the wait time  
15 setting if the result of the decision is found to be  
"OK" and the wait time adjusting flag is set in the ON  
state.

4. The apparatus according to claim 3, further  
comprising a memory device, provided in the wait  
20 time initializing/changing control section, for  
storing data on the wait time set by the wait time  
initializing/changing control section.

5. A semiconductor testing apparatus for  
supplying a test input signal to a semiconductor device  
25 as a testing target and receiving an output signal of  
the semiconductor device, comprising:

a measuring device for setting a test measuring

condition including an initial value of a wait time  
from a supply of the test input signal to the  
semiconductor device until the output signal of the  
semiconductor device becomes stable and performing  
5 measurement on the semiconductor device under the set  
test measuring condition;

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a measuring control apparatus, connected to the  
measuring device, for effecting such control as to  
allow the measuring device to perform processing in  
10 accordance with a predetermined measuring processing  
loop and deciding a stable state of the output signal  
of the semiconductor device, the measuring processing  
loop being a series of processes comprising performing  
measurements by the measuring device in a repeated way,  
15 storing the results of such measurements, counting the  
number of measurements,  $i$ , where  $i$  = a positive integer  
of 1 or more, if it is decided that the number of  
measurements,  $i$ , equals a target number of  
measurements,  $j$ , where  $j$  = a positive integer of 1 or  
20 more, analyzing in realtime based on a statistical  
procedure a data array corresponding to a  $j$  number of  
measurement results obtained by the number of  
measurements,  $j$ , deciding a stable state of the  
measuring data from the result of analysis, if the  
25 result of the decision is found to be "NG", repeating  
such measurement, such realtime analysis on a new data  
array and such stable state decision, and

a wait time calculating device, connected to the measuring control apparatus, for, if the result of the decision by the measuring control apparatus is found to be "OK", allowing control to exit from the measuring processing loop and control to be passed, the wait time calculating device counting a real measurement time corresponding to the number of measurements,  $i$ , and automatically detecting the optimal wait time value.

6. The apparatus according to claim 5, wherein said measuring control apparatus includes a measuring data storing device, connected to the measuring device, for storing data on the result of the measurement by the measuring device; a number of measurements counting device, connected to the measuring device, for counting the number of measurements,  $i$ , measurements are repeatedly made by the measuring device; a number of measurements deciding device, connected to the number of measurements counting device, for deciding whether the number of measurements,  $i$ , in the number of measurements counting device has reached a calculation target number of measurements,  $j$ ; a calculating device, connected to the measuring data memory device and number of measurements deciding device, for calculating based on a statistical procedure a data array corresponding to the  $j$  number of measurement results obtained from the number of measurements,  $j$ , and analyzing the measured data in realtime; and a stable

state deciding device, connected to the calculation device, for deciding a stable state of the measured data from the analytical result of the calculation device, said measuring processing loop being a series of repeated processes for, if a result of stable state decision is found to be "NG", effecting the measurements, realtime analysis on a new data array based on the statistical procedure and stable state decision until the result of decision becomes "OK" or exceeds a maximal number of measurements.

7. The apparatus according to claim 5, wherein the wait time calculating device calculates a real measuring time corresponding to the number of measurements,  $i$ , by one real measuring time  $\Delta t \times i$ .

8. The apparatus according to claim 5 wherein the measuring control apparatus store the result of calculation from the wait time calculating device in the wait time memory device and effects such control as to automatically optimize the wait time of the test measuring condition based on the stored value.

9. A method for testing a semiconductor device comprising the steps of:

preparing a semiconductor device as a testing target;

setting a wait time to an initialized value;

supplying a test signal to the semiconductor device and, upon receipt of a response signal outputted

from the semiconductor device in accordance with the test signal after an elapse of the initialized wait time, measuring the electrical characteristics of the semiconductor device;

5           effecting an OK/NG decision on the semiconductor device in accordance with the result of measurement;

          if the result of the decision is found to be "NG", effecting a repeated setting of the wait time such that, until the result of the decision is "OK", the  
10       wait time is sequentially incremented from the initialized value toward an initially determined maximal value; and

          terminating the setting of the wait time if the result of the decision is "OK".

15       10. A method for testing a semiconductor device comprising the steps of:

          preparing a semiconductor device as a testing target;

          setting a wait time to an initialized value;

20       supplying a test signal to the semiconductor device and, upon receipt of a response signal which is outputted from the semiconductor device in accordance with the test signal after an elapse of the initialized wait time, measuring the electrical characteristics of  
25       the semiconductor device;

          effecting an OK/NG decision on the semiconductor device in accordance with a result of the decision;



if the result of the decision is found to be "NG",  
effecting such repeated wait time setting as to allow  
the wait time to be sequentially decremented from the  
initialized value toward an initially determined  
5 minimal value until the result of the decision becomes  
"OK"; and

terminating the wait time setting if the result of  
the decision becomes "OK".

11. A method for testing a semiconductor device  
10 comprising the steps of:

preparing a semiconductor device as a testing  
target;

setting test measuring conditions including an  
initialized value of a wait time from a supply of  
15 a test input signal to the semiconductor device until  
an output signal of the semiconductor device becomes  
stable;

performing repeated measurements on the  
semiconductor under the set different test measuring  
20 conditions;

storing the respective results of the measurements  
and counting the number of measurements,  $i$ , where  $i$   
represents a positive integer of 1 or more;

deciding whether or not the number of  
25 measurements,  $i$ , has reached the calculation target  
number of measurements,  $j$ , where  $j$  represents  
a positive integer of 1 or more;

when it is decided that the number of  
measurements,  $i$ , has reached the calculation target  
number of measurements,  $j$ , analyzing in realtime based  
on a statistical procedure a data array corresponding  
5 to a  $j$  number of measurement results thus far obtained  
from the number of measurements,  $j$ , and deciding a  
state of the measured data from the result of analysis,  
and, if the result of decision is found to be "NG",  
effecting measurement, realtime analysis on the data  
10 array based on the statistical procedure and stable-  
state decision in a repeated setting until the result  
of decision becomes "OK" or exceeds a maximal number of  
measurements; and,

if the result of the decision is OK, calculating  
15 a real measuring time corresponding to the number of  
measurements,  $i$ , and detecting the optimal wait time  
value.